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the invention is the very perfect insulation from the earth. This allows of the employment of the earth as half of the conducting circuit, without risk of the current finding a shorter course through some imperfectly insulated point.

For nearly two years Mr. Cooke has tried this plan successfully on the Blackwall Railway, and lately on the Manchester and Leeds line. Two important advantages arise from the employment of the earth as a conductor:—

1. One wire is saved in each circuit, thus diminishing complexity and cost; and,
2. The earth acting as a vast reservoir of electricity, the resistance offered to the transmission of electricity is vastly diminished, and the battery is able to work through a much greater distance with a smaller conducting wire.

It is thus that each telegraph now in use on the Great Western Railway can be made to work with two wires only.

HULLMANDEL'S LITHOTINT PROCESS.

By B. Rotch, Esq. V.P.

From the time of Senefelder, who invented lithography in 1796, up to the present day, this beautiful art has gone on gradually improving; but, in no instance, has so important a step been made as in that of Mr. Hullmandel's process of producing original drawings or fac-simile copies as may be required. Previously to the lithotint process being introduced, crayons made of a composition of grease, wax, shel-lac, soap, and black, were used for a similar purpose.

Mr. Hullmandel's process, which is the result of numerous experiments, may be thus described:—

The drawing having been sketched, tinted, and finished by the artist on the stone with lithographic ink mixed with water to produce the various shades, which is as easily done as on paper, is covered over with gum-water, and weak nitric acid to fix it. After remaining a sufficient time to dry, a solution of rosin in spirits of wine is poured over the stone, and as this ground contracts by drying, it cracks into thousands of reticulations, which can only be discovered by the use of a microscope. Very strong acid is then poured over the aquatint coating, which, entering all the fissures, produces the same effect on the stone as the granulations of the chalk by the ordinary process. The rosin protects the drawing in every part except in the cracks. The acid having remained a sufficient time to act on the unprotected parts of the drawing, is removed, the ground is washed off, and all appearance of the subject on the stone vanishes, until ink being applied by a roller in the ordinary way, it is reproduced, and ready for taking off the required number of impressions, which, in some cases, have extended to the number of two thousand.

JUCKES'S PATENT FURNACE.

THE fire-bars of this furnace are formed into an endless chain, passing over two drums, one in the front and the other at the back of the furnace, and are moved forward either by hand or by a strap from the steam-engine.

If not attached by a strap to the steam-engine, the attendance of a boy is sufficient to keep it in motion: the rate of speed being equal to six feet in an hour.

The fuel is let into the furnace underneath the door, which, being suspended, instead of hung in the ordinary way, forms a gauge for the coals, which are thus equally spread over the bars. The fuel is admitted in front of the furnace, and carried in by the motion of the bars; the consequence of which is, that the fresh fuel becomes ignited from that already on fire. No fresh fuel is thrown on the burning coals, and the smoke, passing in its passage towards the chimney across the ignited and red-hot fuel, becomes entirely consumed. The bars are subjected to the intensity of the furnace during a very short period, and are kept perfectly clear from clinkers. Any small quantity of clinker which may be formed is carried out under a stop at the back of the furnace, and falls into an iron box mounted on wheels, which is easily drawn forward when required, as the wheels run on rails fixed for the purpose.

The fire-bars come out hot, and enter quite cool, and are thus prevented from being rapidly destroyed by the continuous action of intense heat at one part. Small coal is advantageously used in this furnace.